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IS 11373 (1985): Guidelines for laboratory disc
pelletisation test for iron ore pellets [MTD 13: Ores and
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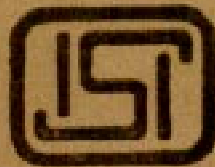


IS : 11373 - 1985

Indian Standard

GUIDELINE FOR
LABORATORY DISC PELLETISATION OF
IRON ORE FINES

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Indian Standard

GUIDELINE FOR LABORATORY DISC PELLETISATION OF IRON ORE FINES

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(Continued on page 2)

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(Continued from page 1)

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(Continued on page 9)

Indian Standard

GUIDELINE FOR LABORATORY DISC PELLETISATION OF IRON ORE FINES

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 20 June 1985, after the draft finalized by Ores and Raw Materials Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 Laboratory disc pelletisation test of iron ore fines is a method by which input and operating parameters for pelletising of given raw materials can be established. The test data are useful in design of pelletisation plant and optimisation of existing plant practice for improving pellets productivity as well as quality. Several procedures exist for pelletising on a laboratory disc-pelletiser and the purpose of this guideline is to evolve a common test procedure which will facilitate comparison of results obtained by tests carried out at different laboratories.

0.3 In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960*.

1. SCOPE

1.1 This standard prescribes the guidelines for the method for preparation of iron ore pellets using a laboratory disc pelletiser. These guidelines have been formulated in order to facilitate the comparison of test data from various organizations on the same pellets. For individual organizations, the parameter may be varied as required.

2. TEST SAMPLE

2.1 The raw materials test sample used for pelletizing should have the following size range:

- a) Iron ore and other iron bearing materials — 2 000 Blaine Number.
- b) Fluxes and coke breeze shall be ground to the same fineness.

*Rules for rounding off numerical values (*revised*).

2.2 The above materials should be thoroughly mixed in a mixer. Commercial grade bentonite (0.5 percent) should be added during the mix preparation as a binder. About 30 kg of homogenised mix should be prepared.

3. APPARATUS

3.1 The laboratory disc pelletiser should have 1 m disc diameter and 150 mm lip height. The disc should be supported and rotated at different speeds by reduction gears, driven by an electric motor of 1.5 kW capacity. The pelletising disc should be provided with two scrapers, one for the disc surface and another for the wall. Charging should be controlled by a feeding pan. The unit should be provided with a water sprayer.

3.2 In case pelletising is under different conditions of disc dimensions, speed, angles of disc, firing condition, etc, the same should be reported.

4. PROCEDURE

4.1 Initially a small quantity of about 2 kg of mix should be fed slowly to generate seed pellets and as the pellets increase in size, addition rate material should be increased. Water should be added with the help of a water spraying arrangement during the balling operation. The pelletising disc should be kept at an angle of 45° to the horizontal and rotated at a speed of 20 rev/min. The disc should be thoroughly cleaned prior to balling to avoid any contamination from the previous charge. After all the concentrate is added, with optimum moisture, the pellets should be rolled for another 2 minutes to achieve a smooth spherical surface.

4.2 The green pellets should then be removed from the disc and screened on 5 mm, 9 mm, 16 mm and 20 mm sieves. The 9 to 16 mm size pellet should be dropped from a height of 300 mm on to a mild steel plate (3 mm thick) and should sustain a minimum of 10 drops without any breakage.

4.3 The green pellete should then be dried in an oven under oxidising conditions at a temperature of 120°C for 4 hours and then subjected to firing in a muffle type furnace at a temperature of $1\ 200 \pm 10^\circ\text{C}$ for 30 minutes.

5. CONDITIONS

5.1 The conditions of pelletising should be reported as follows:

- a) Dimension of disc pelletiser;
- b) Speed of rotation;
- c) Angle of the disc;

- d) Percentage moisture added;
- e) Charge mix, composition;
- f) Screen analysis of pellets produced;
- g) Green pellet strength as obtained by drop test;
- h) Drying temperature and time; and
- j) Firing temperature and duration.

5.2 The properties of pellets, namely, porosity, compressive strength before and after reduction, resistance to tumbling and abrasion, reducibility, degradation index, swelling, softening and chemical analysis shall be determined according to procedures specified in the respective standards.

5.3 Data should be presented in the proformae given in Appendices A, B and C. Minimum of four test should be conducted under any set of conditions. At least two of which should give reasonably reproducible results (within ± 10 percent).

A P P E N D I X A

(Clause 5.3)

**CHEMICAL ANALYSIS (DRY BASIS) AND SIZE DISTRIBUTION
OF FLUXES, FUEL, ETC**

SL No.	CONSTITUENTS, PERCENT	COKE OR LIME- STONE OTHER FUEL	DOLOMITE	SILICEOUS MATERIAL	OTHER FLUXES	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1.	Fe (total)					
2.	FeO					
3.	SiO ₂					
4.	Al ₂ O ₃					
5.	CaO					
6.	MgO					
7.	MnO					
8.	S					
9.	P					
10.	Na ₂ O + K ₂ O					
11.	C					
12.	Ash					
13.	Volatile matter					
14.	Combined water					

SIZE ANALYSIS

Blaine No.

Method of size analysis
wet/dry sieving

A P P E N D I X B*(Clause 5.3)***COMPOSITION OF THE PELLETTISING**

SL No.	CONSTITUENTS OF PELLET FEED, PERCENT	TEST No. 1	TEST No. 2	TEST No. 3	TEST No. 4
(1)	(2)	(3)	(4)	(5)	(6)
1.	Ore mix				
2.	Siliceous material				
3.	Limestone				
4.	Dolomite				
5.	Other fluxes (if any)				
6.	Coke (or alternative fuel)				
7.	Binder				
8.	Other additions (if any)				

APPENDIX C

(Clause 5.3)

PELLET QUALITY DATA

SL No.	ITEM	TEST No. 1	TEST No. 2	TEST No. 3	TEST No. 4
(1)	(2)	(3)	(4)	(5)	(6)
1.	Tumble strength, +6.3 mm in accordance with IS : 6495-1984*				
2.	Reduction degradation in accordance with IS : 10823-1984† at 500°C				
3.	Reducibility in accordance with IS : 8167-1976‡				
4.	Relative reducibility in accordance with IS : 11292-1985§				
5.	Softening tests in accordance with IS : 11283-1985				
6.	Chemical Analysis of Pellets, Percent Fe (Total) FeO SiO ₂ Al ₂ O ₃ CaO MgO MnO S P Na ₂ O + K ₂ O				
7.	Basicity: CaO/SiO ₂ or $\frac{\text{CaO} + \text{MgO}}{\text{SiO}_2 + \text{Al}_2\text{O}_3}$				
8.	Sieve Analysis:				

*Method of tumbler test for iron ores (*second revision*).

†Method for determination of thermal degradation index (TDI) and reduction degradation index (RDI) of iron oxide: lump ores, sinters and pellets.

‡Method for determination of reducibility of iron ore sinters.

§Method of relative reducibility of iron oxides: lump ore, sinter and pellets.

||Method for determination of softening point of iron oxides (in powder form) : lump ore, sinter and pellets.

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INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

QUANTITY	UNIT	SYMBOL
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

QUANTITY	UNIT	SYMBOL
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

QUANTITY	UNIT	SYMBOL	DEFINITION
Force	newton	N	1 N = 1 kg.m/s ²
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m ²
Frequency	hertz	Hz	1 Hz = 1 c/s (s ⁻¹)
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m ²